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Sustainable development through renewable energy—The fundamental policy dilemmas of Pakistan

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ABSTRACT

This paper deals with fundamental policy mistakes in Pakistan for the cause of sustainable development through renewable energy. It then identifies that the low level of awareness regarding the potentials of renewable energy is the key hurdle in achieving the said cause. The paper further traces the root cause of this low awareness in educational and S&T policies of Pakistan and finally provides some recommendations to avoid dilemmas related to such policies.

Contents

1. Introduction

In Pakistan sustainable development (SD) through utilization of renewable energy is largely considered as an unrealistic idea in existing scenario. Although Sahir and Qureshi [1] suggested that the renewable resources cannot serve as alternative for conventional energy resources, these may yet serve to supplement the long-term energy needs of Pakistan to a significant level if an integrated energy planning approach, consistency in government policies and rational policy instruments to deal with the techno-economic and socio-political barriers are the pre-requisites for long-term sustainable development of the RETs.

The integrated policy approach encompassing techno-economic and socio-political barriers are only possible to address in Pakistan if awareness through integration and emphasis regarding the benefits of renewable energy (RE) will be provided at grassroot level. Thus as the important mode to achieve this aim, the policies are being implemented in entire Pakistan. In this manner the educational, science and technology (S&T) policies and approaches of Pakistan may be considered as a primary tool through which the scope of SD can be revolutionized by utilizing RE. Currently, no such framework is being adopted through which general policies in education and S&T sectors were investigated for the cause of SD. Through this paper, attempts are being made to relate the proper

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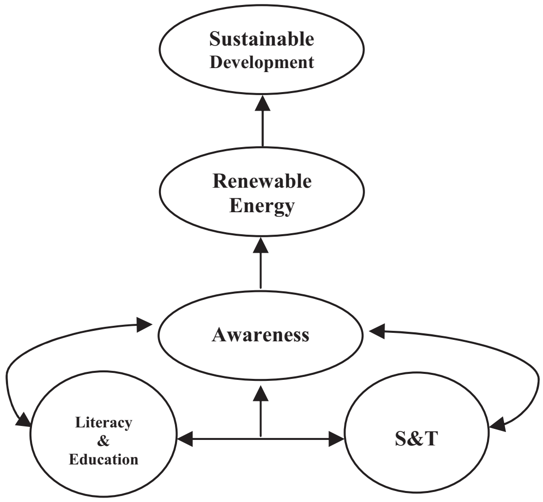


Fig. 1. The scheme of analysis.

functioning of education and S&T sectors as the pre-requisite for SD through RE and on the basis of them the real causes and policy dilemmas for achieving the case of SD were identified. To achieve this objective, first to find the current level of awareness regarding simple renewable energy technologies (RET) were identified through a survey and then policy integration for techno-economic and socio-political will be judged through analysis of literacy, educational and S&T policies and status of Pakistan. The scheme of analysis is shown in Fig. 1

2. Identification of awareness levels regarding simple RET

In order to find the awareness level of general public regarding the applications of simple renewable energy technologies (RETs) a survey was launched for the year 2009 at Pakistan Council of Scientific & Industrial Research (PCSIR) Laboratories, Hyderabad. In this survey, awareness of stakeholders visiting PCSIR was judged regarding the sustainable development on the basis of application of solar thermal technologies (STTs). The reasons for selecting the particular technologies from the bulk of other RET are that:

(i) These technologies support our scheme of analysis for sustainable development as common people are much more aware regarding the heating impact of sun in general as compared to the impact of other renewable resources.
(ii) These technologies incorporate S&T, simpler to use, have potential for poverty reduction and community development through provision of basic needs (heating and cooking, etc.) on sustainable basis through the utilization of solar energy.
(iii) Majority of areas of Pakistan are sunny and sunshine between 7 and 8 h daily or approximately 2300–2700 h per annum falls [2] and there exists a huge potential for utilization of this solar energy keeping in view of the work done by Mirza et al. [3] and Muneer et al. [4].

On the basis of the advantages mentioned above attempts were made to find the awareness regarding the application of STT through a survey. Thus the outcome of the survey in larger terms provides overall picture for awareness regarding RET in Pakistan and will be beneficial in identifying the future chances for sustainable development through RE. The survey was based upon a questionnaire and a total of 300 questionnaires were distributed to various stakeholders visiting PCSIR. In return a response from 250 stakeholders was received. Through the response it was also identified that mainly stakeholders from six sectors i–e Government, Academia, Financial Institutions, Industry, Farmers and NGO's are currently interested in RET.

Table 1
Categorization of stakeholders in terms of different level of awareness.

S. no.	Level	Nos.
1.	Unaware	172
2.	Low	43
3.	Medium	35
4.	High	0
	Total	250

In order to obtain better picture regarding levels of awareness of stakeholders four different categories were defined:

(i) *Unaware*: In this category those stakeholders are placed, who do not have any idea about the solar thermal devices earlier before visiting PCSIR.
(ii) *Low*: This category belongs to stakeholders, who do already posses knowledge about the solar thermal devices but are unable to identify their requirements from the use of these devices.
(iii) *Medium*: Stakeholders in this category are aware of from the solar thermal devices and they have already identified their specific requirements. Instead of guidance, stakeholders in this group put demands on PCSIR to fulfill their requirements.
(iv) *High*: This category is reserved for stakeholders who are well aware of the solar thermal devices that they may even guide and also propose some technical modifications in the design and development of the solar thermal devices to improve their efficiency.

On the basis of above definitions, when the responses of stakeholder were analyzed the categorization of stakeholders in terms of different levels of awareness is summarized in Table 1.

Their sole purpose of visiting PCSIR was based upon getting the awareness. The percentage of stakeholders belonging to low category is 17%. The medium category had almost equal numbers of stakeholders as compared to low category. The category had the ratio of 14% of stakeholders.

However, it was a surprise to see that not a single stakeholder from any walk of life came to guide PCSIR in improving the efficiency of his/her products. Hence, it also represents the shortage in the availability of experts in the field of STT. Only few institutions are working in this field, however no experts from general public are found. Thus, none of the stakeholders is falling into this category.

The values of Table 1 are further plotted in pie chart; the percentage share of various stakeholders belonging to different categories are represented in Fig. 2.

It was observed that 69% of all stakeholders did not have any knowledge about the application of solar thermal devices.

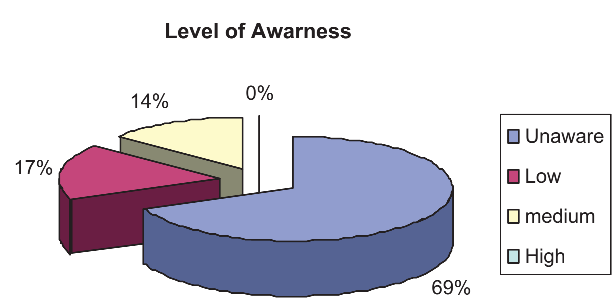


Fig. 2. Percentage share of awareness.

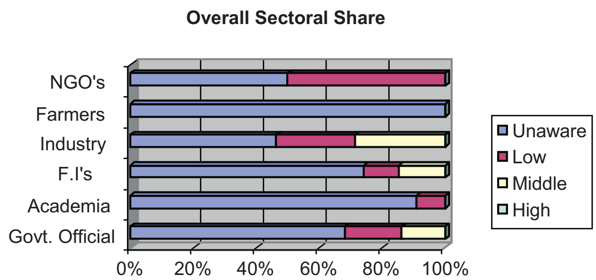


Fig. 3. Sectoral share of awareness.

From the survey it is visible that in all the sectors majority of stakeholders are unaware regarding the application of STT (Fig. 3). In this critical scenario, when the majority of its population is even unaware regarding some of the basic concepts of RE i–e STT, the case for sustainable development through RE in Pakistan seems very weak.

Therefore in order to find the root causes for this low awareness regarding RE and its technologies, the basic policy dilemmas were further investigated in relation to the status of literacy/education and S&T policy status of Pakistan in the following sections.

3. Literacy and education system and sustainable development in Pakistan

Pakistan's overall literacy rate (age 10 years and above) is 56% (69% for males and 44% for females) [5]. Thus one of the major impediments in achieving the sustainable development in Pakistan is its lower literacy rate, as almost half of its population is illiterate and unable to create awareness regarding the scope and potentials of RE and its technologies. The case of SD through RE in Pakistan becomes further discouraging if education system is also taken into account. The education system in Pakistan is non-functioning and provides not much attention towards sustainable development. It consists of multiple systems of education. The Federal, Provincial and Cambridge education systems are some of the examples. These systems are further subdivided into subsystems operated by private and public sectors. Variety in educational system is generally criticized for providing parallel education system and promoting inequalities. For the cause of SD through RE even if this major factor is ignored and attention is only focussed on the syllabus, course contents and programs is offered in institutions belonging to these systems it is evident that no or less importance has been given for the said cause. This trend starts from the primary level up to university level. However, fragmented work is done by few universities mainly on the basis of environmental protection prospective. The study on broader perspective of sustainable development is mainly ignored by majority of institutions. Not only this missing approach is felt in general education system but the things become more alarming if the nomenclature of technical education system is investigated. In Pakistan, technical boards are the main bodies responsible for promoting the technical education and skill enhancement. Boards, posses a moderate network of institutions spread in entire Pakistan but it is unfortunate that these institutes are not running any program, which can address sustainable development through the promotion of RE. It is believed that these institutions can ideally work for the cause of sustainable development if their infrastructure can be used intelligently. The technical educational institutions need to focus on promoting renewable energy through community mobilization. The potential of these institutes can be ideally used to provide a variety of services related to RET like after sales services of solar thermal devices with the joint coordination of NGOs and private sector. By doing so, these institutes can charge meager amount from the client as well. So these technical institutions not only become self sufficient but also contribute much towards the sustainable development by improving the awareness level of common people. In Pakistan, another important cause for the poor performance of the education system towards sustainable development is political and bureaucratic favoritism.

The impacts of this favoritism are further discussed in the following section by conducting a case study for primary education in one province of Pakistan.

3.1. Non-functioning of Pakistan's education system: a case study of Sindh's primary education

The non-functioning of education system in Pakistan to promote the concept of sustainable development through RE as discussed above is not only due to low literacy, availability of multiple education system having no focus on RE but also to political and bureaucratic favoritism that is also a key hurdle in poor functioning of educational system. This fact is quite visible by performing the case study of one of its provinces i–e Sindh and its primary education. Sindh is one among four provinces of Pakistan. The education system is mainly supported by the government. The official statistics regarding primary education of this province provides much help in understanding the overview of Pakistan's educational setup and how it is being affected by the political and bureaucratic favoritism.

In Sindh, when the district wise ranking of primary education [6] overviewed by making population as the basis for the provision of primary education (Table 2). It was a surprise to know that in majority of cases the numbers of primary schools are not in proportion to the population. Similarly, the teaching staff itself is further not in proportion to the numbers of primary schools. This miss-match did stop here but the number of teaching staff is also not in line with numbers of enrolled students. These sorts of irregular patterns for provisions of services in public sector are not only limited to education sector but can also be visualized in almost all public service sectors. These irregular patterns not only represent the improper execution of policies, but also the political and bureaucratic favoritism but in longer run become major hurdle for the sustainable development in utilizing education as a tool.

From the above discussion it is quite visible that the basic requirement for sustainable development is awareness, which certainly mainly comes from the education and literacy. For the Pakistan case it has been witnessed that the low level of literacy and non-functioning, parallel system of education having no focus on the RET are some of the dilemmas for creating hurdles for sustainable development. The following section will further discuss the status of S&T in Pakistan and sheds some light on its role for the cause of sustainable development through diffusion of RET among the masses of Pakistan.

4. S&T and sustainable development

To achieve the aim of SD through RE in any country can only be possible successfully if the country has enough awareness regarding its importance. Apart from education policies other important policy aspects through which the awareness could be created are the national S&T policies. In Pakistan the impact of national S&T policies for SD through RE is discussed below.

4.1. S&T status of Pakistan

Globally, countries are utilizing S&T as an essential tool to achieve sustainable development. In Global Competitiveness Report 2009–2010 [7] Pakistan's overall ranking is 105 among 137 countries analyzed globally on various pillars such as

Table 2
Status of primary education in Sindh.

Rank/district	Population (2008) P	Nos. of primary school 2006–2007	Primary teaching staff 2006–2007	Enrollment in primary school 2006–2007
1	Karachi	Tharparkar	Karachi	Karachi
2	Khairpur	Khairpur	Sanghar	Khairpur
3	Hyderabad	Badin	Khairpur	Dadu
4	Sanghar	Thatta	Naushero Feroze	Naushero Feroze
5	Thatta	Sanghar	Hyderabad	Ghotki
6	Dadu	Karachi	Dadu	Sanghar
7	Badin	Nawabshah	Thatta	Larkana
8	Nawabshah	Naushero Feroze	Badin	Badin
9	N. Feroze	Umerkot	Larkana	Thatta
10	Larkana	Mirpurkhas	Mirpurkhas	Nawabshah
11	Mirpurkhas	Dadu	Tharparkar	Kamber @ Shahdadkot
12	Ghotki	Ghotki	Ghotki	Mirpurkhas
13	Kamber @ Shahdadkot	Kamber @ Shahdadkot	Nawabshah	Hyderabad
14	Tharparkar	Jacobabad	Shikarpur	Tharparkar
15	Sukkur	Kashmore Kandhkot	Sukkur	Sukkur
16	Shikarpur	Shikarpur	Jacobabad	Shikarpur
17	Jacobabad (Reconstituted	Larkana	Kamber @ Shahdadkot	Kashmore
18	Kashmore @ Kandhkot	Sukkur	Umerkot	Umerkot
19	Umerkot	Tando M. Khan	Matiari	Matiari
20	Jamshoro	Matiari	Jamshoro	Jacobabad
21	Matiari	Hyderabad	Kashmore	Jamshoro
22	Tando Allahyar	Jamshoro	Tando Allahyar	Tando Allahyar
23	T.M. Khan	Tando Allahyar	Tando M. Khan	Tando M. Khan

Source: Compilation from District Development Indicators, 2008, P&D, Govt. of Sindh.

Institution, Infrastructure, and Macroeconomic Stabilities. This low ranking is not a promising one if Pakistan has to move on the path of sustainable development by utilizing RE. Among these pillars the 9th pillar was designated for technological readiness. Pakistan's ranking for this pillar is also very low; this represents the bleak picture of Pakistan standing in technological readiness, which represents low attention towards new technologies including the RET. The poor performance of Pakistan in terms of technological readiness and its inability to advance in innovation lies not only on lower literacy rates and education systems having no focus on sustainable development but also heavily on S&T status and policies of Pakistan.

4.2. National Science and Technology Policies

Science and technology status of Pakistan after its independence in 1947 was not strong. It inherited very meagre infrastructure of science and technology, which included one university, four research laboratories and a few industries with primitive technology [8]. Pakistan S&T status further suffered from the early loss of its founder and first Prime Minister. The early loss of its prime leadership further weakened the Pakistan's vision for setting up its S&T priorities. The real work for S&T policy formulation in real terms was started very late after the establishment of S&T cell in the Ministry of Science and Technology in 1975. The cell produced the first policy draft of National Science and Technology in 1976, which was approved in 1984.

A country which took almost 37 years to produce its first S&T policy had already lost much of its ground to accelerate in S&T. Still now National Science and Technology Policy (NSTP) of 1984 is the only full combined policy of S&T produced by Pakistan, whereas only one separate National Technology Policy (NTP) was launched in 1993. The NSTP-1984 touched all the aspects related to scientific and technological development of Pakistan. It defines and provides outlines for the organization and structure of S&T to university research, technology development to S&T manpower, service condition and incentive for S&T manpower to the promotion of S&T, international liaison to financing of S&T. However, recently the new government also constituted a committee to formulate a new science and technology policy.

Thus, it is clear that Pakistan's weaker performance for sustainable development through S&T is quite visible from the fact that in its entire period of existence, it was able to launch only two policies pertaining to S&T. Therefore it is not possible for a country aged 53 years to depend merely on two policies to utilize S&T for sustainable development when enormous new challenges and approaches were developed during this period. It is also doubted that these meager number of policies, are even not sufficient to boost S&T in Pakistan. Therefore their impact for sustainable development must be a distant one. A country which is only able to produce one full National Science and Technology Policy (1984) and one National Technology Policy (1993) had already lost much of its grounds for the development of its Nation more precisely on the ground of sustainable development. The factors responsible for the absence of regular introduction of policies in Pakistan are political instability, political will, bureaucrats' motivation, leadership deficiencies and unavailability of S&T policy experts. In Pakistan majority of policies are formulated by politicians of ruling parties supported by bureaucrats holding key posts in government. Politicians and bureaucrats tend to avoid taking the burden taking do not want to adopt innovative thinking. This passive approach of policy makers results in unavailability of policies on regular basis responsible for deteriorating condition of science and technology in Pakistan.

NSTP-1984 focuses on popularization of science and technology but the measures it suggest were not implemented fully, whereas the NTP-1993 give more emphasis on industrially based technological development. National Commission of Science and Technology also does not consider inclusion of this approach as one of its goals. Technology itself is the product of interaction of science with society (NSTP-1984). It was also realized that the community people have little or no awareness regarding advancement in science and technology excepting home and mobile appliances. Similarly they are unaware of their role in economic growth as well. The unawareness results in the creation of lesser interest among community people to take advantage from technologies to change their living standard, which best suits, their needs, area and resource. The situation can be much better if the recommendation of NST Policy of 1984 were implemented efficiently such as the establishment of design centers for appropriate technologies,

launching of science and technology centers for the promotion of S&T, introduction of science and technology clubs in all educational institutes and establishment of museum and display centre of science and technology. It is important to mention that NST Policy-1984 emphasized to launch all these initiative at town, district and city level but (25) years passed but we are unable to do so. The outcome of this is exactly pointed out by Mirza et al. [9] by suggesting that the community participation is only restricted to just a few demonstrated projects, which resulted in lack of coordination among departments/institutions responsible for RE development and commercialization. The above mentioned points are some of the major policy dilemmas for achieving the cause of sustainable development through RE on the basis of S&T status of Pakistan.

5. Conclusion

It is now evident that to achieve sustainable development through RE, National Educational Policies must be redesigned in such a way that they must be supportive to National Science and Technology Policies to create awareness regarding sustainable development through RE. The weaker impact of National Science and Technology Policies, and traditional educational system (more precisely the technical education) towards sustainable development is due to lesser focus on community participation to achieve this cause. Therefore to avoid such policy dilemmas for sustainable development more importance needs to be given to community participation for the promotion of sustainable development concepts through RE.

6. Recommendations

1. In order to achieve better results for sustainable development national policies for S&T and poverty alleviation should be made available on regular basis.
2. Technical education infrastructure can be efficiently utilized to promote the concept of sustainable development through the introduction of courses dealing with renewable energy technologies.
3. Trained S&T policy making professionals are needed to be involved in policy making process at all levels.
4. While setting the priorities of S&T at national/provisional level the concept of community mobilization should be incorporated to create awareness regarding sustainable development through RE.
5. Political and bureaucratic favoritism may be controlled in the execution of policies to achieve better results from them.

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